

# PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C. 20231  
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 21 February 2000 (21.02.00)	
International application No. PCT/JP99/03189	Applicant's or agent's file reference P20636-P0
International filing date (day/month/year) 15 June 1999 (15.06.99)	Priority date (day/month/year) 15 June 1998 (15.06.98)
Applicant KADO, Hiroyuki et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
28 December 1999 (28.12.99)

☐ in a notice effecting later election filed with the International Bureau on:  
\_\_\_\_\_

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Antonia Muller
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

533 Rec'd PCT/PTO 00/719134 07 DEC 2000  
**PRICE AND GESS**

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**COPY OF PCT REQUEST**

Applicant(s):

Hiroyuki Kado et al.

Title:

PLASMA DISPLAY PANEL WITH SUPERIOR LIGHT-  
EMITTING CHARACTERISTICS, AND METHOD AND  
APPARATUS FOR PRODUCING THE PLASMA  
DISPLAY PANEL

Attorney's  
Docket No.:

NAK1-BN23

**"EXPRESS MAIL" MAILING**  
**LABEL NO. EL227718303US**

**DATE OF DEPOSIT: December 7, 2000**

## PCT REQUEST

P20636-P0

Original (for SUBMISSION) - printed on 14.06.1999 06:30:48 PM

0	For receiving Office use only	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	Form - PCT/RO/101 PCT Request Prepared using	PCT-EASY Version 2.84 (updated 01.06.1999)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	Japanese Patent Office (RO/JP)
0-7	Applicant's or agent's file reference	P20636-P0
I	Title of invention	PLASMA DISPLAY PANEL WITH SUPERIOR LIGHT-EMITTING CHARACTERISTICS, AND METHOD AND APPARATUS FOR PRODUCING THE PLASMA DISPLAY PANEL
II	Applicant	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
II-5	Address:	1006, OazaKadoma, Kadoma-shi, Osaka 571-8501 Japan
II-6	State of nationality	JP
II-7	State of residence	JP
II-8	Telephone No.	06-6908-5831
II-9	Facsimile No.	06-6906-8766
III-1	Applicant and/or inventor	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	KADO, Hiroyuki
III-1-5	Address:	1-15-34-107, Niitaka, Yodogawaku, Osaka-shi, Osaka 532-0033 Japan
III-1-6	State of nationality	JP
III-1-7	State of residence	JP

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III-2	<b>Applicant and/or inventor</b>	
III-2-1	This person is:	applicant and inventor
III-2-2	Applicant for	US only
III-2-4	Name (LAST, First)	OHTANI, Mitsuhiro
III-2-5	Address:	3-8-31, Kouryounakamachi, Sakai-shi, Osaka 591-0024 Japan
III-2-6	State of nationality	JP
III-2-7	State of residence	JP
III-3	<b>Applicant and/or inventor</b>	
III-3-1	This person is:	applicant and inventor
III-3-2	Applicant for	US only
III-3-4	Name (LAST, First)	AOKI, Masaki
III-3-5	Address:	5-12-1, Aoshinke, Mino-shi, Osaka 562-0024 Japan
III-3-6	State of nationality	JP
III-3-7	State of residence	JP
III-4	<b>Applicant and/or inventor</b>	
III-4-1	This person is:	applicant and inventor
III-4-2	Applicant for	US only
III-4-4	Name (LAST, First)	MIYASHITA, Kanako
III-4-5	Address:	1-24-11, Saigoutoori, Moriguchi-shi, Osaka 570-0034 Japan
III-4-6	State of nationality	JP
III-4-7	State of residence	JP
IV-1	<b>Agent or common representative; or address for correspondence</b>	
	The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name (LAST, First)	NAKAJIMA, Shiro
IV-1-2	Address:	6F, Yodogawa 5-Bankan, 2-1, Toyosaki 3-chome, Kita-ku, Osaka-shi, Osaka 531-0072 Japan
IV-1-3	Telephone No.	06-6373-3246
IV-1-4	Facsimile No.	06-6373-3105
IV-1-5	e-mail	nakapate@cap.bekkoame.or.jp
V	<b>Designation of States</b>	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	EP: DE FR GB NL

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V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	CN KR US
V-5	<b>Precautionary Designation Statement</b> In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	<b>Exclusion(s) from precautionary designations</b>	NONE
VI-1	<b>Priority claim of earlier national application</b>	
VI-1-1	Filing date	15 June 1998 (15.06.1998)
VI-1-2	Number	10-166620
VI-1-3	Country	JP
VI-2	<b>Priority claim of earlier national application</b>	
VI-2-1	Filing date	30 June 1998 (30.06.1998)
VI-2-2	Number	10-183758
VI-2-3	Country	JP
VI-3	<b>Priority claim of earlier national application</b>	
VI-3-1	Filing date	31 July 1998 (31.07.1998)
VI-3-2	Number	10-217260
VI-3-3	Country	JP
VI-4	<b>Priority claim of earlier national application</b>	
VI-4-1	Filing date	06 August 1998 (06.08.1998)
VI-4-2	Number	10-222987
VI-4-3	Country	JP
VI-5	<b>Priority claim of earlier national application</b>	
VI-5-1	Filing date	17 February 1999 (17.02.1999)
VI-5-2	Number	11-039280
VI-5-3	Country	JP
VI-6	<b>Priority claim of earlier national application</b>	
VI-6-1	Filing date	18 May 1999 (18.05.1999)
VI-6-2	Number	11-137763
VI-6-3	Country	JP

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VI-7	<b>Priority claim of earlier national application</b>		
VI-7-1	Filing date	18 May 1999 (18.05.1999)	
VI-7-2	Number	11-137764	
VI-7-3	Country	JP	
VI-8	<b>Priority document request</b> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1, VI-2, VI-3, VI-4, VI-5, VI-6, VI-7	
VII-1	<b>International Searching Authority Chosen</b>	European Patent Office (EPO) (ISA/EP)	
VIII	<b>Check list</b>	number of sheets	electronic file(s) attached
VIII-1	Request	5	-
VIII-2	Description	108	-
VIII-3	Claims	40	-
VIII-4	Abstract	1	pct-55..txt
VIII-5	Drawings	29	-
VIII-7	TOTAL	183	
VIII-8	<b>Accompanying items</b>	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-9	Separate signed power of attorney	✓	-
VIII-10	Copy of general power of attorney	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-17	Other (specified):	Request for transmittal of priority document	-
VIII-18	Figure of the drawings which should accompany the abstract	4	
VIII-19	Language of filing of the international application	English	
IX-1	<b>Signature of applicant or agent</b>		
IX-1-1	Name (LAST, First)	NAKAJIMA, Shiro <i>Shiro Nakajima</i>	

## FOR RECEIVING OFFICE USE ONLY

10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/EP

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10-6	Transmittal of search copy delayed until search fee is paid	
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## FOR INTERNATIONAL BUREAU USE ONLY

11-1	Date of receipt of the record copy by the International Bureau	
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# PCT

WIPO	PCT
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(PCT Article 36 and Rule 70)

I	<input checked="" type="checkbox"/>	Basis of the report
II	<input type="checkbox"/>	Priority
III	<input checked="" type="checkbox"/>	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	<input checked="" type="checkbox"/>	Lack of unity of invention
V	<input checked="" type="checkbox"/>	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	<input type="checkbox"/>	Certain documents cited
VII	<input type="checkbox"/>	Certain defects in the international application
VIII	<input checked="" type="checkbox"/>	Certain observations on the international application

Form PCT/IPEA/409 (cover sheet) (January 1994)



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/JP99/03189

**I. Basis of the report**

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

**Description, pages:**

2,4,8-108	as originally filed		
1,1a,3,3a,5,6,6a, 7	as received on	21/06/2000 with letter of	21/06/2000

**Claims, No.:**

5-10,12,13,16,17, 22-27,29-52,57-60, 63-65,70,73,78,80, 82,83,99, 109-111	as received on	21/06/2000 with letter of	21/06/2000
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**Drawings, sheets:**

1/29-29/29	as originally filed
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2. The amendments have resulted in the cancellation of:

- |   |         |   |
|---|---------|---|
| <input type="checkbox"/> the description,       | pages:  |   |
| <input checked="" type="checkbox"/> the claims, | Nos.:   | 1-4,11,14,15,18-21,28,53-56,61,62,66-69,71,72,74-77,79,81,84-98,100<br>-108 |
| <input type="checkbox"/> the drawings,          | sheets: |   |

3. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

**see separate sheet**

4. Additional observations, if necessary:

**see separate sheet**

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/JP99/03189

## III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.
- ☒ claims Nos. 24-27, 30-60, 66-92, 99-101, 103, 104, 109-111.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

**see separate sheet**

- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for the said claims Nos. .

## IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/JP99/03189

☒ not complied with for the following reasons:

**see separate sheet**

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

☐ all parts.

☒ the parts relating to claims Nos. 1-111 as originally filed.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes:	Claims	1-23,28,29,61-65,93-98,102,105-108
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-23,28,29,61-65,93-98,102,105-108
Industrial applicability (IA)	Yes:	Claims	1-23,28,29,61-65,93-98,102,105-108
	No:	Claims	

2. Citations and explanations

**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/JP99/03189

Reference is made to the following documents:

D1: EP-A-0 554 172

D2: JP-A-02 018 834

**Re Item I**

**Basis of the report**

The common concept of the claims as originally filed is the use of a dry gas. This feature has been omitted in some of the claims as amended. It appears that the original documents only disclose a PDP production method in which a dry gas is used, and a PDP which was produced by this method. Moreover only a method in which a dry gas is used, and a PDP which was produced by this method have been searched for.

**The Report is therefore based not on the claims as amended but on claims 1-111 as originally filed.**

**Re Item VIII**

**Certain observations on the international application**

1. Although claims 1,3-5,8-12 and 93,95 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought. The aforementioned claims therefore lack conciseness. Moreover, lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/JP99/03189

which protection is sought, and places an undue burden on others seeking to establish the extent of the protection.

Not all claims which include all the features of any other claim contain a reference to the other claim and then state the additional features which it is desired to protect (Rule 6.4a PCT).

Hence, claims 1,3-5, 8-12 and 93,95 do not meet the requirements of Art. 6 PCT.

2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

**Re Item III**

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

See Item VIII

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. D1 (see in particular the places indicated in the Search Report) describes a plasma display panel (PDP) production method comprising :  
a fluorescent substance application step for applying fluorescent substances to at least one of: a side of a front panel facing a back panel; and a side of the back panel facing the front panel; and a heating step for heating either or both of the front panel and the back panel to which the fluorescent substances have been applied.

The problem to be solved by the present invention may be regarded as providing

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/JP99/03189

a method for the production of a PDP which has high light-emitting efficiency and good colour reproduction (see page 4, lines 19-21 of the description).

D2 describes a production method for a display device comprising :  
a fluorescent substance application step for applying fluorescent substances to the inner side of a front panel and  
a heating step for heating the front panel to which the fluorescent substances have been applied, wherein  
the heating step is performed while the applied fluorescent substances are in contact with a dry gas.

It was therefore obvious for a person skilled in the art to bring, in the heating step of the method of D1, the fluorescent substances in contact with a dry gas.

The method according to claim 1 does therefore not involve an inventive step (Art. 33 (3) PCT).

2. Claims 2-9, 11-23, 28, 29 and 61-64 do not appear to contain any features which, in combination with the features of claim 1 meet the requirements of the PCT in respect of inventive step, the reasons being as follows:

A person skilled in the art would always try use one heating step for all process steps which need heating and he would use dry air for drying also materials other than fluorescent substances. a person skilled in the art would choose the conditions as necessary for the various process steps.

3. Since the production method is obvious, this is also true for the PDP produced in accordance with this method. Therefore the PDP according to claim 65 does also not involve an inventive step (Art. 33 (3) PCT).

4. In order to carry out the method according to the method claims, a person skilled in the art would provide an apparatus with the features of claims 93 or 95. Within his normal skill he can also provide the features of claims 94, 97, 98, 102 and 105-108.

The apparatus according to claims 93-98, 102 and 105-108 does therefore also not involve an inventive step (Art. 33 (3) PCT).

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/JP99/03189

5. Claim 10 does not comprise a fluorescent substance application step. It cannot be understood which problem is solved by the method according to claim 10 (Rule 5.1iii PCT). The method according to claim 10 can certainly not contribute to the solution of the above technical problem.  
Therefore the method according to claim 10 does not involve an inventive step (Art. 33 (3) PCT).

**Re Item IV**

**Lack of unity of invention**

The claims as amended do not relate to subject-matter which is so linked as to form a common inventive concept (Rule 13 (1) PCT) because the feature "dry gas" which was the "special technical feature" (Rule 13 (2) PCT) was omitted from some of the claims.

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>P20636-P0</b>	<b>FOR FURTHER ACTION</b> <small>see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.</small>	
International application No. <b>PCT/JP 99/ 03189</b>	International filing date (day/month/year) <b>15/06/1999</b>	(Earliest) Priority Date (day/month/year) <b>15/06/1998</b>
Applicant  <b>MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.  
☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☒ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

**4. With regard to the title,**

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

**5. With regard to the abstract,**

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

**6. The figure of the drawings to be published with the abstract is Figure No.**

- ☐ as suggested by the applicant.
- ☐ because the applicant failed to suggest a figure.
- ☒ because this figure better characterizes the invention.
- 3  
☐ None of the figures



# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/JP 99/03189

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 24--27, 30-60, 66-92, 96, 99-101, 103, 104, 109-111  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 24--27,30-60,66-92,96,99-101,103,104,109-111

In view of the large number and also the wording of the claims presently on file, which render it difficult, if not impossible, to determine the matter for which protection is sought, the present application fails to comply with the clarity and conciseness requirements of Article 6 PCT (see also Rule 6.1(a) PCT) to such an extent that a meaningful search is impossible. Consequently, the search has been carried out for those parts of the application which do appear to be clear and sufficiently concise, namely claims 1-23, 28,29,61-64,93-95,97,98,102,105-108.

These claims, although not worded as required by Rule 6.4 PCT, have in common that a dry gas is used at least in one production step.

It is possible that the application comprises more than one invention/group of inventions (Rule 13 PCT).

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 99/03189

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H01J17/49 H01J9/22

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 554 172 A (FUJITSU LTD) 4 August 1993 (1993-08-04) see abstract column 25, line 44-56 ---	1,2
Y	PATENT ABSTRACTS OF JAPAN vol. 014, no. 161 (E-0909), 28 March 1990 (1990-03-28) & JP 02 018834 A (NEC KANSAI LTD), 23 January 1990 (1990-01-23) abstract --- -/-	1,2

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
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Date of the actual completion of the international search

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 99/03189

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 167 (E-1528), 22 March 1994 (1994-03-22) & JP 05 342991 A (FUJITSU LTD), 24 December 1993 (1993-12-24) cited in the application abstract  -----	

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 99/03189

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29

DESCRIPTION

PLASMA DISPLAY PANEL WITH SUPERIOR LIGHT-EMITTING  
CHARACTERISTICS, AND METHOD AND APPARATUS FOR  
PRODUCING THE PLASMA DISPLAY PANEL

5 FIELD OF THE INVENTION

This invention relates to a plasma display panel used as a display for a color television receiver or the like, and also relates to a method of producing the plasma display panel.

10 BACKGROUND OF THE INVENTION

Recently, Plasma Display Panel (PDP) has received attention as a large-scale, thin, lightweight display for use in computers and televisions, and the demand for high-definition PDPs has also increased.

15 FIG. 29 is a sectional view showing a general AC-type PDP.

In the drawing, a front glass substrate 101 is covered by a stack of display electrodes 102, a dielectric glass layer 103, and a dielectric protecting layer 104 in the order, where  
20 the dielectric protecting layer 104 is made of magnesium oxide (MgO) (see, for example, Japanese Laid-Open Patent Application No.5-342991.

Address electrodes 106 and partition walls 107 are formed on a back glass substrate 105. Fluorescent substance layers 110 to 112 of respective colors (red, green, and blue) are formed in space between the partition walls 107.

5           The front glass substrate 101 is laid on the partition walls 107 on the back glass substrate 105 to form space. A discharge gas is charged into the space to form discharge spaces 109.

          In the above PDP with such a construction, vacuum  
10   ultraviolet rays (their wavelength is mainly at 147nm) are emitted as electric discharges occur in the discharge spaces 109. The fluorescent substance layers 110 to 112 of each color are excited by the emitted vacuum ultraviolet rays, resulting in color display.

15           The above PDP is manufactured in accordance with the following procedures.

          The display electrodes 102 are produced by applying silver paste to the surface of the front glass substrate 101, and baking the applied silver paste. The dielectric glass layer  
20   103 is formed by applying a dielectric glass paste to the surface of the layers, and baking the applied dielectric glass paste. The protecting layer 104 is then formed on the dielectric glass layer 103.

          The address electrodes 22 are produced by applying  
25   silver paste to the surface of the back glass substrate 105, and

baking the applied silver paste. The partition walls 107 are formed by applying the glass paste to the surface of the layers in stripes with a certain pitch, and baking the applied glass paste. The fluorescent substance layers 110 to 112 are formed  
5 by applying fluorescent substance pastes of each color to the space between the partition walls, and baking the applied pastes at around 500°C to remove resin and other elements from the pastes.

After the fluorescent substances are baked, a sealing  
10 glass frit is applied to an outer region of the back glass substrate 105, then the applied sealing glass frit is baked at around 350°C to remove resin and other elements from the applied sealing glass frit. (Frit Temporary Baking Process)

The front glass substrate 101 and the back glass  
15 substrate 105 are then put together so that the display electrodes 102 are perpendicular to the address electrodes 106, the electrodes 102 facing the electrodes 106. The substrates are then bonded by heating them to a temperature (around 450°C) higher than the softening point of the sealing glass. (Bonding  
20 Process)

The bonded panel is heated to around 350°C while gases are exhausted from inner space between the substrates (space formed between the front and back substrates, where the fluorescent substances are in contact with the space)  
25 (Exhausting Process). After the exhausting process is



that the production cost is reduced.

The above first object is achieved by setting the color temperature of light to 7,000K or more, more preferably to 8,000K or more, 9,000K or more, or 10,000K or more when the  
5 light is emitted from all the cells.

To increase the color temperature in the white balance, it is important to improve the chromaticity of light emitted from blue fluorescent substance layers. This is achieved by setting the chromaticity coordinate  $y$  (the CIE color  
10 specification) of light to 0.08 or less, more preferably to 0.07 or less, or 0.06 or less when the light is emitted from only the blue cells or when vacuum ultraviolet rays are radiated onto the blue cells to excite the blue fluorescent substances. Alternatively, this is achieved by setting the peak wavelength  
15 of a spectrum of light to 455nm or less, more preferably to 453nm or less, or 451nm or less when the light is emitted from the blue cells when light is emitted from only the blue cells.

The color reproduction is also improved when the chromaticity of light emitted from blue fluorescent substance  
20 layers is improved.

The above PDP with improved chromaticity of light emitted from blue fluorescent substance layers is manufactured by a PDP production method in which the processes for heating the fluorescent substances (e.g., the fluorescent substance  
25 baking process, sealing material temporary baking process,

bonding process, and exhausting process) are performed in the dry gas atmosphere, or in an atmosphere in which a dry gas is circulated at a pressure lower than the atmospheric pressure.

The inventors of the present invention found in the manufacturing procedure in accordance with conventional PDP production methods that the blue fluorescent substances are degraded by heat when the fluorescent substances are heated in the processes and that the degradation leads to reduction in the light-emitting intensity and the chromaticity of emitted light. The inventors have provided the above PDP production method of the present invention and made it possible to prevent blue fluorescent substances from being degraded by heat.

Here, the "dry gas" indicates a gas containing steam vapor with lower partial pressure than the typical partial pressure. It is preferable to use an air processed to be dried (dry air).

It is desirable that the partial pressure of the steam vapor in the dry gas atmosphere is set to 15Torr or less, more preferably to 10Torr or less, 5Torr or less, 1Torr or less, 0.1Torr or less. It is desirable that the dew-point temperature of the dry gas is set to 20°C or lower, more preferably to 10°C or lower, 0°C or lower, -20°C or lower, -40°C or lower.

The above PDP with improved chromaticity of light emitted from blue fluorescent substance layers is also manufactured by a PDP production method in which: the front and

back panels are temporarily baked while a space is opened between their facing sides; the front and back panels are bonded while a dry gas is circulated in an inner space between the panels; or the front and back panels are bonded together after  
5 preparatively heated while a space is opened between their facing sides.

Both of the first and second objects of the present invention are achieved by: a method in which after the front panel and the back panel are bonded together by a sealing  
10 material in between by maintaining a bonding temperature, the exhausting process is started while the panels are not cooled from the bonding temperature to room temperature, and gases are exhausted from the inner space between the panels; or a method in which after the front panel and the back panel with a sealing  
15 material in between are temporarily baked by maintaining a temporary bonding temperature, then the bonding process is started while the panels are not cooled from the temporary bonding temperature to room temperature.

In the actual manufacturing procedure, each of such  
20 heating processes is performed using a heating furnace. Conventionally, the sealing material temporary baking process, the bonding process, and the exhausting process are separately performed, and the panels are cooled to room temperature at each interval between processes. With such a construction, it  
25 requires a long time and consumes much energy for the panels to